

Application/Control Number: 09/786,823

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*Cancel claim 17*

1. A method of watermarking a digital image, comprising the steps of:  
transforming the digital image using a wavelet transform(WT);  
transforming a watermark using discrete cosine transform(DCT); and  
integrating the DCT-transformed watermark with the wavelet-transformed image to generate a watermark-embedded image.
2. The method of claim 1, comprising the step of inverse wavelet transforming the wavelet transformed image.
3. The method of claim 1, wherein the DCT-transformed watermark is further transformed using  $m$ -level wavelet transform before being integrated with the wavelet-transformed image.
4. The method of claim 3, wherein said wavelet transform is performed using a filter bank realizing high-speed wavelet-transform.
5. The method of claim 1, wherein said wavelet transform is performed using a filter bank realizing high-speed wavelet-transform.

watermark, a scaling parameter,  $\alpha$ , is used to adjust the spacing between the original image and the watermark.

7. The method of claim 1, wherein the digital image and the watermark are black and white.
8. A system for watermarking a digital image comprising:  
means for providing a digital image and a watermark, and  
a digital processing system for transforming the digital image using wavelet transform(WT), transforming the watermark using discrete cosine transform (DCT) and integrating the DCT-transformed watermark with the wavelet - transformed image to generate a watermark-embedded image.
9. A system of claim 8, wherein the system includes means for carrying out digital watermarking a black and white image using the wavelet transform(WT) and the discrete cosine transform (DCT), wherein the watermark is black and white.
10. A system of claim 9, comprising means for providing an m-level wavelet transform (WT) before it is integrated wavelet transformed image.

discrete cosine transform (DCT) transforming a watermark,  
wavelet transform (WT) a color image, and  
integrating the DCT-transformed watermark with wavelet transform (WT) color  
image

13. A method of claim 12, comprising the steps of:  
converting the color image in the RGB mode,  $RGB(x)$ , into  $Y(x)$ ,  $I(x)$ , and  $Q(x)$   
in the YIQ mode using a conversion matrix.
14. A method of claim 13, comprising the steps of:  
transforming  $Y(x)$  of the converted image using wavelet transform;  
transforming a watermark,  $W(y)$ , using discrete cosine transform(DCT);  
integrating the DCT-transformed watermark,  $WC(y)$ , with the wavelet-  
transformed color image,  $DW(x)$ ;  
generating Y-values of the integrated image,  $Y(x)'$ , using inverse wavelet  
transform; and  
generating a watermark-embedded image in the RGB mode,  $RGB(x)'$ , by  
inverse transformation of  $Y(x)'$ ,  $I(x)'$ , and  $Q(x)'$ .
15. The method of claim 12, wherein the DCT-transformed watermark  $WC(y)$  is  
further transformed using m-level wavelet transform before being integrated with  
the wavelet-transformed color image  $DW(x)$ .
16. The method of claim 12, wherein said wavelet transform is performed using  
filter-banks realizing high-speed wavelet-transform.

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18. A system of digital watermarking a color image comprising:  
means for providing a color image and a black and white watermark; and  
a digital data processing means for digital watermarking the color image with the black and white watermark using wavelet transformation(WT) and discrete cosine transform (DCT).
19. A system according to Claim 18, comprising :  
means for converting the color image in the RGB mode,  $RGB(x)$ , into  $Y(x)$ ,  $I(x)$ , and  $Q(x)$  in the YIQ mode using a conversion matrix;  
means for transforming  $Y(x)$  of the converted image using wavelet transform;  
means for transforming the watermark in black and white,  $W(y)$ , using DCT;  
means for integrating the DCT-transformed watermark,  $WC(y)$ , with the wavelet-transformed color image,  $DW(x)$ ;  
means for generating Y-values of the integrated image,  $Y'(x)$ , using inverse wavelet transform; and  
means for generating a watermark-embedded image in the RGB mode,  $RGB(x)'$ , by inverse transformation of  $Y(x)'$ ,  $I(x)'$ , and  $Q(x)'$ .
20. A system of digital watermarking a color image, comprising :  
means for converting the color image in the RGB mode,  $RGB(x)$ , into  $Y(x)$ ,  $I(x)$ , and  $Q(x)$  in the YIQ mode using a conversion matrix;  
means for transforming  $Y(x)$  of the converted image using wavelet transform;  
means for transforming a watermark,  $W(y)$ , using DCT;  
means for further transforming the DCT-transformed watermark  $WC(y)$  using m-level wavelet transform;  
means for integrating the DCT-transformed watermark,  $WC(y)$ , with the wavelet-transformed color image,  $DW(x)$ ;  
means for generating Y-values of the integrated image,  $Y'(x)$ , using inverse wavelet transform; and  
means for generating a watermark-embedded image in the RGB mode,  $RGB(x)'$ , by inverse transformation of  $Y(x)'$ ,  $I(x)'$ , and  $Q(x)'$ .